# REDUCING TECHNICAL WATER CONSUMPTION IN MANUFACTURING PLANTS BY REDIRECTING WATER USED IN AUXILIARY PROCESSES FOR RECYCLING

**Azimova A.B.[1], Yarlakabov S.B.[2], Yuldoshev S.M.[3], Shonazarov M.I.[4]**

*[1]Azimova Aziza Bozorovna - Assistant*
*[2]Yarlakabov Sardor Komilovich - Assistant*
*[3]Yuldoshev Sarvarbek Mavlon ugli - Doctoral student,*
*[4]Shonazarov Munis Ilhom ugli - Assistant*
*DEPARTMENT METALLURGY*
*NAVOI STATE UNIVERSITY OF MINING AND TECHNOLOGIES,*
*NAVOI, REPUBLIC OF UZBEKISTAN*

***Abstract:*** *in the process of treating oxide gold ores using cyanidation and sorption methods, there are several auxiliary processes, including loading ion-exchange resins into special resin carrier machines and distributing resins into sorption technological chains, which require a certain amount of technical water. This article investigates methods for partially reducing technical water consumption by redirecting the technical water used in auxiliary processes in the Sorption departments of hydrometallurgical plants for recycling as circulating water.*
***Keywords:*** *technical water, circulating water, ion-exchange resins, mini pachuk, specialized resin transport vehicle, resin dispenser.*

# СОКРАЩЕНИЕ ПОТРЕБЛЕНИЯ ТЕХНИЧЕСКОЙ ВОДЫ НА ПРОИЗВОДСТВЕННЫХ ПРЕДПРИЯТИЯХ ПУТЕМ ПЕРЕНАПРАВЛЕНИЯ ВОДЫ, ИСПОЛЬЗУЕМОЙ ВО ВСПОМОГАТЕЛЬНЫХ ПРОЦЕССАХ, НА ВТОРИЧНУЮ ПЕРЕРАБОТКУ

**Азимова А.Б[1], Ярлакабов С.К.[2], Йулдошев С.М.[3], Шоназаров М.И.[4]**

*[1]Азимова Азиза Бозоровна - ассистент*
*[2]Ярлакабов Сардор Комилович - ассистент*
*[3]Йулдошев Сарварбек Мавлон угли - докторант,*
*[4]Шоназаров Мунис Илхом угли - ассистент*
*кафедра «Металлургия»*
*Навоийский государственный горно-технологический университет,*
*г. Навои, Республика Узбекистан*

***Аннотация:*** *в процессе переработки оксидных золотосодержащих руд методами цианирования и сорбции существует ряд вспомогательных процессов. К ним относятся загрузка ионообменных смол в специализированные смолотранспортные машины и распределение смол по сорбционным технологическим цепочкам, требующим определенного расхода технической воды. В статье исследуются методы частичного снижения расхода технической воды за счет перенаправления технической воды, используемой во вспомогательных процессах сорбционных установок гидрометаллургических заводов, на переработку оборотной воды.*
***Ключевые слова:*** *техническая вода, оборотная вода, ионообменные смолы, мини-пачук, специализированный смоловоз, дозатор смолы.*

*UDK 669.2*

**Introduction.** As we know, the processes of mineral processing in hydrometallurgical plants are carried out mainly in an aqueous medium. [1] In addition to enrichment and hydrometallurgical processes, a certain amount of technical water is also used in many auxiliary processes. For example, in the sorption and regeneration shop, technical water is used for screening and washing resins from the pulp, transporting saturated and regenerated resins through pipelines or loading resin into resin transport vehicles, and loading regenerated resin into distribution bunkers and sorption technological chains using dispensers. [3] Due to the fact that most of the technical water used for auxiliary processes, such as in sorption, is added directly to the technological processes, the water is discharged into the waste storage facility as part of the waste pulp. This leads to a partial increase in the consumption of technical water. If these waters are not processed and treated, they can cause damage to the land and soil. [4]

**Research and its methodology.** According to Central Asian hydrometeorological scientists, if we do not intensify the rational use of water and implement water conservation measures, water may become one of the most pressing issues in the desert regions of Central Asia within the next decade due to global warming and the resulting environmental problems. Furthermore, considering that the majority of hydrometallurgical plants and mineral deposits in Central Asia are located in desert zones, technical water for industrial use is transported to these facilities from long distances using pumps. This factor alone significantly increases the value of water for us.

At some hydrometallurgical plants, saturated ion-exchange resin is delivered to the Sorption and Regeneration Workshops, which process existing oxide gold ores, from several other divisions of the plants using special resin-carrying trucks. The resin is received, and the trucks are then filled with unsaturated resin and sent back to the divisions. During the process of filling trucks with resin (which can take 1-2 hours, depending on the truck bunker volume and technological conditions for continuous resin supply, as in many cases the amount of resin in collection bunkers may be insufficient when 2 or more "resin carriers" are received

by the workshops per day), water is also added to the bunker along with the resin (regenerated or saturated) to ensure dense filling. During filling, special drainage holes in the truck hopper are opened, and water from the hopper is continuously discharged until it is filled with resin. Due to the presence of resin and resin fragments in the outflowing water, on the work area surface, and around the working parts of drainage pumps, this water is pumped to the pachucas of the sorption technological circuits. As a result, according to research findings, 10-15 $m^3$ of technical water used for filling each truck is discharged into the waste storage facility along with the waste pulp.

In addition to the above situation, the regenerated resin sent from the Regeneration unit to the Sorption unit of the workshop is continuously discharged into the resin distribution bunkers and evenly distributed to the technological chains using dispensers. During resin transportation, the ratio of solid to liquid phases should be at least 1:3 to prevent clogging of the supply pipelines. The operating principle of the dispensers is automated, and tasks are assigned to them by the control panel operator based on technological indicators. In some cases, due to high resin flow, there are instances of partial filling of bunkers with water and resin. In such situations, special drainage nets are installed to prevent the resin from overflowing from the bunker and to remove excess water. Water that has passed through the drainage is also discharged into the technological chains. In this case, a certain amount of 20-25 $m^3$/day of water is discharged into the waste storage facility along with the waste pulp.

In both cases, we are losing a certain amount of technical water, for example, 10-15 $m^3$ when filling one resin transport vehicle, and up to 20-25 $m^3$ per day from each bunker. The possibility and method of preventing these situations and reducing the consumption of technical water by directing it to the thickening process equipment as circulating water investigated.

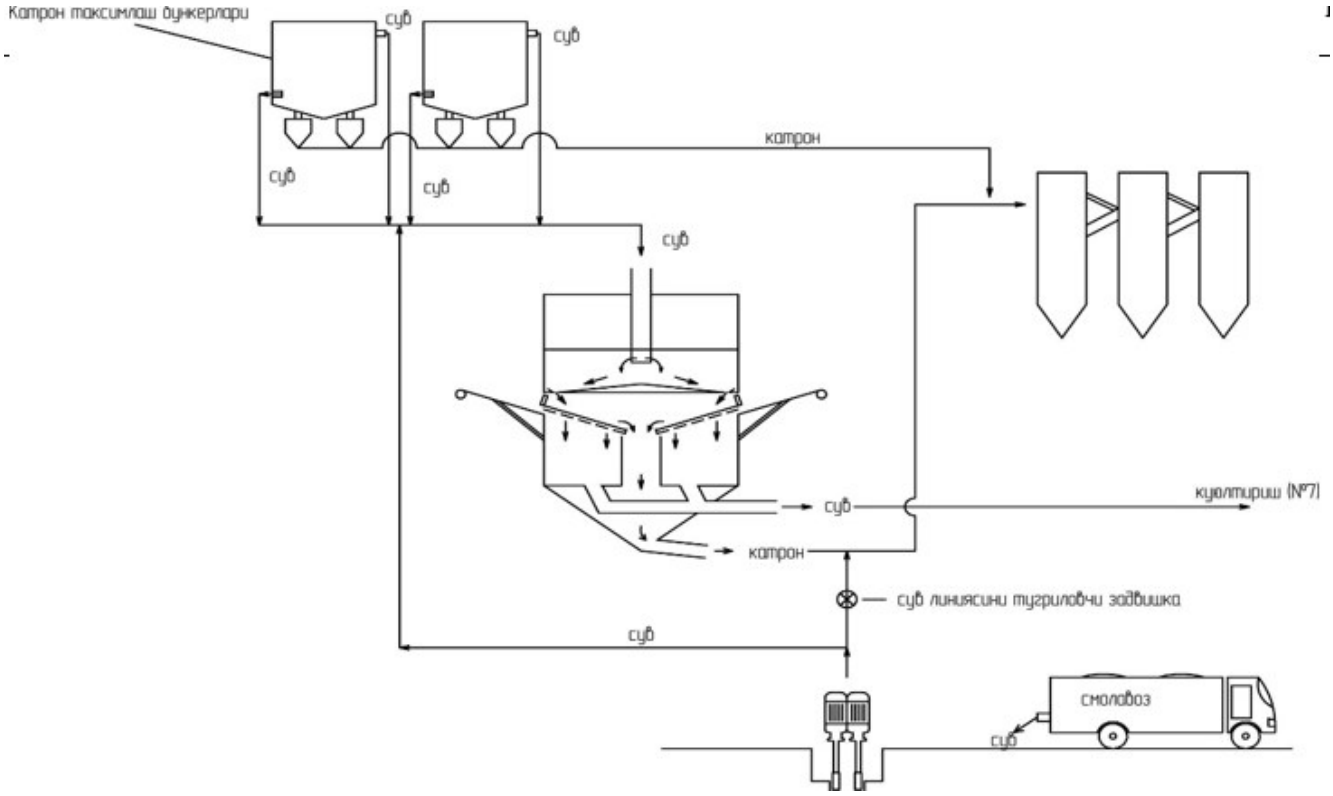


*Fig. 1. Equipment chain diagram for water extraction from auxiliary processes.*

The research work was carried out using the equipment chain diagram shown in Figure.

*Table 1. The research results are presented.*

| No | Auxiliary processes | Technical water consumption in auxiliary processes ($m^3$/day) | Technical water consumption of the hydrometallurgical plant ($m^3$/day) |
|---|---|---|---|
| 1 | Average resin loading and unloading for one special machine **(number of machines 2÷4)** | **15** | **50,000 ÷ 140,000** |
| 2 | Redistribution of regenerated resins to technological chains **(number of bunkers 1÷2)** | **30** | |
| **Total daily:** | | **45 ÷ 120** | |
| **Average daily difference:** | | **49,930 ÷ 139,890** | |

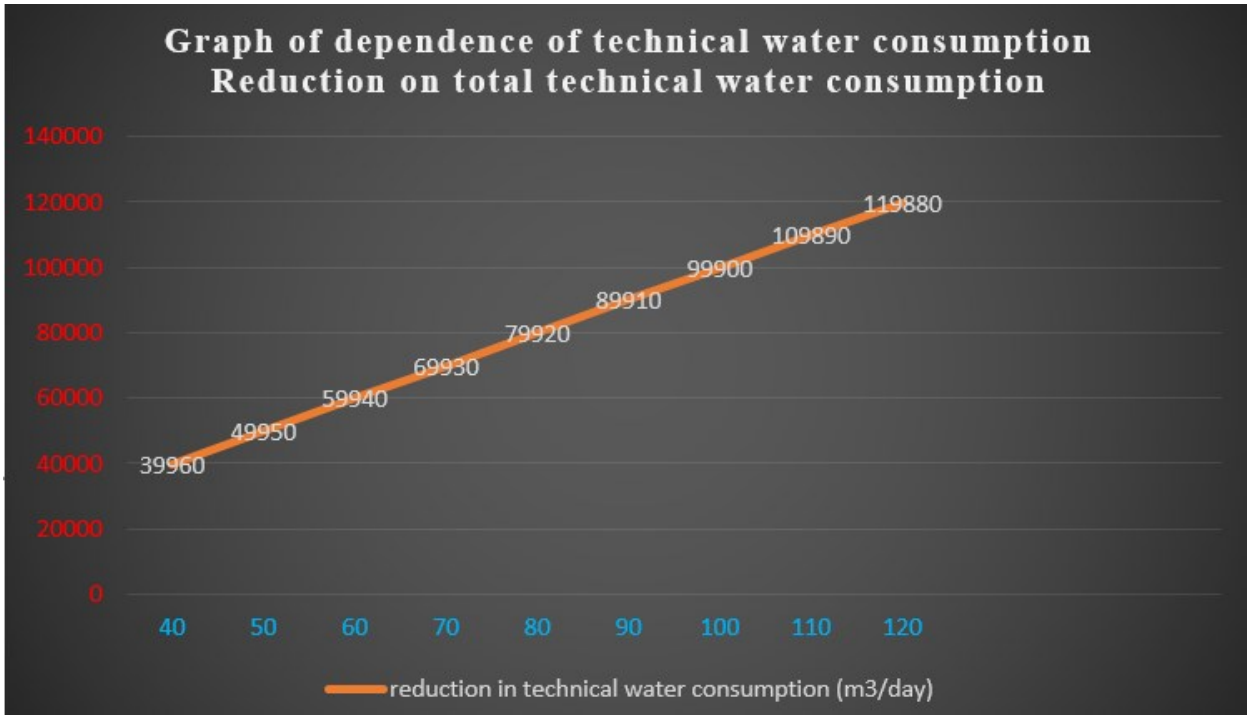


*Fig. 2. Graph showing the relationship between the decrease in technical water consumption and total technical water consumption.*

According to the scheme shown in Figure 1, to separate resins from the circulating water, a mini-pachuk is installed in a certain part of the Sorption unit (a convenient area for resin unloading and distribution of regenerated resins to technological processes). The circulating water separated from the resin transport machine and resin bunkers is directed to the installed mini-pachuk. The mini-pachuk consists of two or more drainage screens, through which water passes via plastic pipes to a thickener located near the unit. The water separated in the thickener is reused as circulating water in other technological processes. Since the amount of resin remaining on the screen is very small and regenerated, it is loaded into the final positions of the Sorption technological chains.

**Conclusion.** Based on the conducted research and obtained technical indicators, it can be concluded that the implementation of the research work described in this article at certain production facilities does not negatively impact the technological process. It does not require significant economic costs, additional operation of the drainage pump, excessive electricity consumption for water extraction, or additional manual labor. This is because the pipeline of the drainage pump, which transports resin from a level of 0.00 m to a level of 19.8-22.4 m in the sorption unit, extends to a level of 22.4 m, eliminating the need for additional drainage pump operation for water extraction. Only during the filling of the truck with resin does the person responsible for loading and unloading ensure water flow to the installed mini-pump by closing the shut-off valves of the resin delivery pipe and opening the water supply valves. As a result, we can save 16,425 to 43,800 $^{m3}$ of technical water per year from the auxiliary processes of the sorption process, depending on the annual production capacity of the enterprise.

***References / Список литературы***


1. *Tolibov I.B., Akhmedov M.S., Yuldoshov S.M.* Research on the extraction of metals from copper industry waste // Digital Technologies in Industry No. 2 / 2023 19 p.
2. *Yuldoshev S.M., Ibotov B.O.* Results obtained using local and foreign flotation reagents in the optimal mode of the Yoshlik deposit // Scientific Impulse No. 4 (100) November 2022. pp. 375-378.
3. *Шоназаров М.И., Омонов А.Ш.* Международный научный журнал “Вестник науки” 2024 Подбор исходного материала и их характеристика для получения сорбентов по применению получение редких металлов на основе местного сырья 1748 – 1754 стр.
4. *Tolibov I.B., Akhmedov M.S., Yuldoshov S.M.* Journal of Advances in Engineering Technology, 2023 Investigation of optimizing the crystalline state of copper slags with $Na_2CO_3$ to improve the flotation process. pp. 66-75.
5. *Akhmedov M.S., Yuldoshov S.M., O'rozov D.T.* Extraction of copper and valuable components from copper industry waste. International Journal of Advanced Technology and Natural Sciences. Vol.1 (6), 2025, pp. 84-87.
6. *Tolibov B.I., Akhmedov M.S., and Yuldoshov S.M.* "INVESTIGATION OF OPTIMIZING THE CRYSTALLINE STATE OF COPPER SLAGS WITH $Na_2CO_3$ TO IMPROVE THE FLOTATION PROCESS" Journal of Advances in Engineering Technology, no. 1, 2023, pp. 66-75. doi:10.24412/2181-1431-2023-1-66-75
7. *Khasanov A.S., Tolibov B.I., Sirozhov T.T., Akhmedov M.S.* New directions for developing the technology of granulation of copper production slags // Eurasian Union of Scientists. 2020. No. 2-4 (71).